RESECTION OF INTESTINE, FOLLOWED BY END-TO-END ANASTOMOSIS.[1]

REPORT OF CASES WITH REMARKS.

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THE indications for resection of some part of the small or large intestine are well defined. Of the more frequent acute conditions may be mentioned the different varieties of gangrene, extensive damage to a loop of intestine through penetrating wounds, especially gun-shot wounds, and the destruction of its blood-supply through traumatic separation of its mesenteric attachment, or through the division of one of the terminal branches of a mesenteric artery.

Of the sub-acute or chronic conditions may be mentioned intestinal fistulæ that do not yield to less stringent measures, chronic obstruction in which coils of intestine are so firmly bound together that their successful separation is impossible and chronic benign strictures, including the tubercular and the rarer syphilitic varieties, especially if associated with intractable ulceration and cancer above the level of the sigmoido-rectal junction.

The clinical features of the acute conditions are so well understood that no special description of them is necessary. On the other hand, the clinical development of those chronic conditions not associated with external or visible change in the abdominal wall, especially of those causing stricture, is so varied and frequently so insidious that early diagnosis is impossible.

In benign stricture a tardy diagnosis does not necessarily affect adversely the chances of permanent relief through some surgical operation; on the other hand, inability to make an early diagnosis in malignant stricture diminishes greatly the chance of successful removal, and even in those occasional cases

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in which resection is possible subsequent recurrence is greatly to be feared.

One of the greatest needs in surgery to-day is the discovery of some method by which malignant disease of internal organs can be detected in its incipient stages; and especially is this true of the organs of the abdominal cavity, for, not only in the intestine, but in the stomach and uterus as well, malignant disease, when its initial symptoms appear, is frequently beyond the possibility of successful cure. For this reason the early manifestations of malignant stricture of the colon should receive most careful consideration and analysis, although any considerable progress in facility of diagnosis can scarcely be achieved; for, in the first place, accurate diagnosis is frequently impossible because of the paucity of the symptoms. Thus, in some cases after a long period of uninterrupted health, the patient suddenly develops the symptoms of acute or subacute obstruction, and subsequent operation discovers a growth that must have existed for years. In the second place, even when early symptoms develop, a wide variation is seen to exist. Thus, in many, disturbances of digestion and increasing difficulty in the passage of the intestinal contents may attract attention. Under this general head, may be mentioned nausea and loss of appetite; the persistent fermentation and gas-production leading to a sense of fulness referred to some particular region in the abdomen—a feeling usually most marked from four or five hours after eating, according to the distance from the stomach to the stricture; the discomfort and occasionally, later, the actual pain, as the intestine above the point of stricture becomes more distended; the subjective sensation of relief due to the passage of the accumulated gas through the narrowed lumen below often accompanied by a marked gurgle. Such a train of symptoms should lead in every instance to repeated careful palpation of the abdomen and in doubtful cases to early exploration particularly where unusual thickness of the abdominal wall might conceal a growth of small size or where the growth lies in some deeper inaccessible part of the abdomen or pelvis.

In other cases, constipation may be the first symptom. Regularly, it should follow the group of symptoms just enumerated. After it has once appeared, it is more marked at those

times when, through the swelling of temporary congestion, the orifice of the stricture is suddenly greatly diminished. With the subsidence of congestion, constipation disappears; it is therefore an intermittent symptom. Occasionally, after ulceration has occurred, the foul discharge induces cartarrhal inflammation of the contiguous intestine and diarrhœa, sometimes with stools containing traces of pus and blood. Hence the "alternating diarrhœa and constipation" of which some authors write and which is actually an exceptional and sometimes misleading symptom, for the growth is almost always scirrhous and the resulting ulceration occurs not only at a later period but also with a discharge that is much less irritating than in the other varieties of carcinoma.

The initial appearance of constipation depends not only upon the degree of stricture but also upon its proximity to the rectum, due to the solidification of the fecal current in the lower part of the large intestine. In the sigmoid flexure, therefore, constipation is more likely to develop at an earlier period than in the upper part of the large intestine. But irrespective of the situation of the growth, constipation with subsequent obstruction develops only when the growth encroaches upon the lumen of the gut. Frequently the colon is involved with little or no diminution of its calibre and constipation is absent throughout.

Finally, in the absence of all previous symptoms, as has already been mentioned, the symptoms of sub-acute or acute obstruction may be the first indication of the presence of the growth.

The objective symptoms which need no special description are those of a tumor with or without an associated ascites and with, later on, the appearance of metastases in the liver and other parts of the body. Ordinarily this tumor cannot be felt for some time after the development of the initial subjective symptoms and even in the later stages it may, as has been stated, be concealed by a thick abdominal wall, the presence of moderate distension, or by the fact that it occupies a position inaccessible to palpation behind some viscus or below the brim of the pelvis. In the latter situation, as in Case IV, it may be felt by rectal examination.

It is also important to note that even under favorable

conditions, a most careful examination may fail to detect the growth a day or two after its successful palpation near the anterior abdominal wall (as in Case III, prior to operation) and also the fact that it may be felt in different parts of the abdomen in successive examinations. Both of these last mentioned variations are most likely to occur in growths that involve any portion of the alimentary canal that is provided with a mesentery and that have not as yet become adherent to immovable parts (in Case III, the ileum, in Case IV, the sigmoid). In the transverse colon a similar degree of mobility might be enjoyed, but in the four ascending or descending colons growths could possess at the very best only a slight range of movement.

The indications for resection in the treatment of stricture admit of little if any discussion. On the other hand, the means by which the patency of the canal shall be re-established vary greatly. Each particular method and each almost unending modification of that method have their adherents, and the investigator who endeavors to unravel the much-vaunted advantages of this or that proceeding encounters a confusing mass of incompatibilities and contradictions.

It is not the intention of the writer to discuss the comparative value of end-to-end, end-to-side, and side-to-side, methods of anastomosis, nor whether anastomosis is preferably accomplished by suture alone or with the aid of some artificial appliance. Much depends upon the condition of the resected ends as well as upon the general condition of the patient, which may be such as to demand the greatest speed. If no special hurry is necessary and if the resected extremities are of equal calibre and of normal appearance and consistency, it is the writer's opinion that any one of several methods will yield satisfactory results, preference being naturally given to that one to which the operator is accustomed. The method of end-to-end anastomosis, of which a brief description follows, is therefore not introduced by the writer as one necessarily superior to those in general use, but merely as one that has given satisfactory results, and seems, in the few cases reported, to have protected the patient from the dangers of a perforative peritonitis.

After the removal of the damaged or diseased intestine

and after the exposed ends have been prepared for suture in the usual way, those portions of the circumference included between the layers of the mesentery are carefully united with two or three interrupted sutures of chromic gut. In the small intestine, where this interval is narrow, one or two are sufficient; in the large intestine, where this interval is much wider, three or even four may be used.

Advancing then to either side alternately of the mesenteric attachment, similar sutures are passed between all the layers of the wall of the intestine except the serous coat and tied (with the exception of the last two or three) from within. In the process of repair, therefore, this first row of sutures should be discharged into the lumen of the gut. A second row of interrupted Lembert silk sutures is now passed around from one side of the mesenteric attachment to the other, the first and last sutures being inserted respectively on either side close to the junction of the mesentery and intestine.

If the sutured ends of the intestine are of normal appearance and free from congestion, the abdominal wound is then closed without further precaution or drainage, except in the sigmoid flexure, where a small cigarette drain may be passed down to the sutured gut. If, on the other hand, either of the resected ends is unduly congested, or friable, or of unequal size, even although the viability is unquestioned, the sutured loop may be fastened to the anterior parietal peritoneum by one or two plain cat-gut sutures and a small drain of gauze inserted on either side. In this way, subsequent leakage which under these circumstances is extremely likely to take place, may be conducted into the dressing, thus obviating the danger of a peritonitis.

In the sigmoid the integrity of the suture line from the distension of the upper segment with either gas or feces may be protected by insertion though the rectum to a point beyond the line of suture, of a rubber tube. This should be introduced by an assistant and guided by the surgeon's finger in the abdominal cavity to the desired point. The wound is then closed in the usual way, after the insertion of a small cigarette drain.

CASE I.—*Strangulated Inguinal Hernia; Necrosis of small Intestines: Resection; Recovery.*—T. M., male, aged thirty-five years; admitted to the Gouverneur Hospital, June 21, 1903.

Patient had had a reducible oblique inguinal hernia for the past ten years. During the latter part of that time he has had several attacks of acute irreducibility, all of which yielded to taxis and palliative treatment. Yesterday, while engaged in lifting, the hernia again became irreducible, and patient was seized with great pain and vomiting. All attempts at reduction failed.

On examination, there is an irreducible swelling in and occupying the region of the left inguinal canal, which presents all the usual symptoms of a strangulated hernia. The swelling extends a short distance below the external ring into the scrotum.

Operation.—Under ether anæsthesia, the hernial sac was exposed by the usual Bassini method. It contained considerable bloody serum, free from odor and a loop of small intestine of dark color and which, although without perforation at the point of constriction, yet was suspiciously flaccid over an area of about two inches in width. It had not yet lost its glistening appearance.

Owing to the doubtful viability of the exposed gut, which after the relief of the constriction (at the internal ring) still retained its dark color and flaccid consistency, its wall was sutured to the margin of the internal ring and a temporary warm dressing was applied. At the end of twenty-four hours, gangrene was established beyond a doubt and resection with end-to-end anastomosis was immediately done. With the completion of the anastomosis, a small wick of gauze was passed down into the abdominal cavity along with the sutured intestine and the remaining part of the wound was closed as far as possible according to the Bassini principle.

At no time during either operation or during the twenty-four hours intervening was the patient's pulse over 100.

Post-operative.—There was little if any reaction, the temperature and pulse both remaining below 100. There was instant cessation of vomiting, and in the course of twenty-four hours passage of flatus from the rectum. There was no distention. During the third day discharge of fecal matter appeared in the wound. This became very abundant but did not represent the entire intestinal contents, as the bowels moved regularly after the second day. The color and consistency of the fecal discharge

corresponded to that ordinarily found in the upper part of the small intestine. At the expiration of a week, it had greatly diminished in amount and before the end of the third week had entirely disappeared. At no time was the general condition of the patient materially weakened.

The wound closed rapidly and at the end of the fifth week, the patient left the hospital.

The patient was examined occasionally during the next twelve months; at the end of which time no recurrence had taken place. Owing to the fact that the wound was left open at its inner angle a late recurrence may be expected.

CASE 2.—T. I., aged forty-seven years; admitted to the Presbyterian Hospital, February 21, 1903. For the past fifteen years, patient has had a reducible right inguinal hernia. During the past five years, the hernia has been satisfactorily held back by a truss. This morning, however, while straining at stool, the hernia became irreducible and painful, slipping down behind the truss. There was some nausea but no vomiting, and the bowels moved to enema freely on both the 21st and 22d.

On examination, there is a right irreducible oblique inguinal hernia, extending down to the testis. There is a distinct expansile impulse on coughing. The swelling, though not painful, is moderately tender. There is slight indefinite pain referred to the lower part of the epigastrium in the middle line. The temperature ranges between 99 and 100, the pulse about 90 to 100.

The foot of the patient's bed was raised by shock blocks and an ice cap applied to the swelling.

February 22. Vomited some broth to-day at noon. No vomiting had occurred at any previous time. Discharge of flatus and a small amount of fecal matter from the bowel. There is more pain and some fulness in the lower part of the epigastrium. On palpation in this region, there is slight tenderness and rigidity.

February 23. Bowels moved to-day with enema. There was one attack of vomiting after taking broth in the morning. There is some restlessness. The hernia is gradually decreasing in size.

February 25. During the night, there was intense abdominal pain with considerable hiccough, interfering with sleep. There was one attack of vomiting during the afternoon and again in the evening. Two movements of the bowels, secured by enema, gave relief. Patient does not look seriously ill.

February 26. A repetition of yesterday. Pulse has not been over 88 at any time since admission and the temperature is normal.

February 27. Another good result from enema. There is still occasional vomiting after taking food.

February 28. To-day, for the first time, visible peristalsis appeared in the right iliac fossa with slight distention of the lower part of the abdomen. Patient feels cramp-like pains which disappear with inward rumblings of gas. There is some rigidity in the lower right quadrant above the situation of the internal ring. General condition unchanged.

During the next forty-eight hours, the hiccoughing and vomiting became less, but the rigidity and distention continued unabated and the bowels moved with increasing difficulty.

Operation.—Ether. A median incision below the umbilicus was made, and the peritoneal cavity opened. There was a small amount of free serous odorless fluid. Over toward the right side, in the lower quadrant, the small intestine was congested and swollen and the loops were smeared with fibrine. Almost immediately, on the separation of these soft adhesions an abscess cavity was opened, and at the wall of internal ring at a point where it had been constricted by the margin of the interna (an adjacent loop of small intestine) an orifice was seen, through which intestinal contents escaped. Another constriction was seen in the loop at a distance of six inches, but this had not given way. The damaged loop which was very friable was resected, followed by end-to-end anastomosis, and after the insertion of several small wicks of gauze, the closure of the remaining part of the wound.

Post-operative course.—Owing to an associated endarteritis, the patient's general condition remained poor for several days, the pulse ranging from 120 to 140, although the temperature was below 100. There was, however, no sign of peritonitis and on the day following operation considerable flatus was expelled through the rectum. On the fourth day, after repeated small doses of phosphate of soda, the bowels moved several times. On the fifth day after operation, at the time of the second dressing, a slight fecal discharge was noticed. On the tenth day, the fecal discharge was quite abundant, but from that time on, rapidly decreased and had entirely disappeared by the 24th day, leaving a healthy granulating surface which slowly cicatrized.

On May 8, patient left the hospital, completely healed, having gained between 20 and 30 pounds in weight.

On examination one year afterward, the patient's general condition was excellent and there was no recurrence of the hernia.

Bacteriological examination of the pus showed the presence of the bacillus coli communis, while that of the excised intestine showed "beginning necrosis."

CASE 3.—H. K., male, aged sixty years; admitted to the Presbyterian Hospital, May 1, 1903. Patient was always well until seven months ago. At that time, without known cause an attack of abdominal pain and vomiting occurred, lasting but a few hours. These attacks have recurred every three or four weeks and recently have lasted for a week or ten days with a sense of obstruction to the passage of the intestinal contents. Vomiting has always occurred shortly after the taking of food, the vomitus consisting of the contents of the stomach and never containing blood in any form. There has been constipation for the past three months, the bowels moving every three days to catharsis.

On examination, there is intermittent moderate distention of the central part of the abdomen. This usually disappears after a movement of the bowels, and at that time, a small ovoid hard tumor can generally be felt in the right iliac fossa. Occasionally no mass can be felt in this situation. Examinations of the stomach and rectum negative.

Operation.—Gas and ether. Under ether no tumor could be felt. An incision below the level of the umbilicus along the outer margin of the right rectus muscle was made and the peritoneal cavity opened. The affected loop of small intestine was easily found directly in front of the promontory of the sacrum within the cavity of the true pelvis and presented a hard nodular tumor, involving its entire circumference, situated about ten inches from the ileo-cæcal junction. The lymphatic glands in the adjacent portion of the mesentery were hard and nodular even as far as its vertebral attachment. This extensive lymphatic involvement necessitated the removal of about eighteen inches of small intestine. An end-to-end anastomosis was then done, and the abdomen closed without drainage.

Post-operative.—Primary union was secured. Flatus was expelled by the rectum and a movement occurred on the first

day after operation. Rectal alimentation was carried out for forty-eight hours and then small quantities of peptonized milk were given. There was no vomiting or distention at any time after the operation.

On gross examination, the tumor appeared to be a scirrhus carcinoma involving the entire circumference of the intestine and diminishing by at least one-half the patency of its lumen. On microscopic examination, the tumor proved to be an adeno-carcinoma.

Six months after the operation, the patient had gained sixty pounds and worked without interruption. The bowels were regular and he was free from pain. About ten months after operation evidences of recurrence appeared in the liver from which the patient died one year after his discharge from the hospital.

CASE 4.—J. E. R., male, aged forty-nine years; referred by Dr. Conkey. Admitted October 22, 1903. Father died of cancer of intestine. With the exception of scarlet fever when a child, an attack of acute articular rheumatism when twenty, and an occasional attack of bronchitis during the winter, patient was always in excellent health until August, 1902, when he first noticed pain in the left side. The pain was usually in the vicinity of the anterior superior spine and was of a burning character. Occasionally it was so severe as to be scarcely endured. The stools were loose and blood-stained and contained shiny matter. The patient was treated for hemorrhoids without any local examination being made. Since that time, there has been gradual loss of flesh and strength. At present, the chief complaints are pain in the left flank, anorexia, general weakness and attacks of diarrhœa with bloody stools.

By rectal examination, a mass can be made out high up through the posterior rectal wall, freely movable from side to side. On bi-manual examination the same mass can be distinctly outlined in the median line midway between the navel and the umbilicus and is about the size of a small orange, hard and nodular. It is freely movable from side to side. There is no evidence of hemorrhoids. There is no glandular enlargement in any part of the body.

Operation.—Incision in the median line, four inches in length, above the symphysis pubis. On opening the peritoneal cavity

a tumor was found near the centre of the sigmoid, involving its entire circumference for a distance of three inches and being from two to three inches in diameter. It was very hard in consistency, evidently of the scirrhus type and accompanied by glandular involvement in the meso-sigmoid nearly as far as the vertebral column. About seven inches of the sigmoid and a corresponding amount of its mesentery, containing all the involved glands, were removed followed by end-to-end anastomosis. A small cigarette drain was inserted to the point of suture after the return of the intestine and a rubber tube was passed through the rectum to a point beyond the suture line. Closure of the abdominal wall.

Post-operative.—Scarcely any vomiting followed the operation. There was little if any reaction and the abdominal wound healed by first intention, the pulse never rising above 100. The drain was withdrawn on the third day and not re-inserted. The bowels moved on the fifth day to small doses of calomel and salts. At the end of the second week patient was placed on regular diet. At the time of discharge, patient says that he is entirely free from the pain of which he complained prior to the operation. The diarrhœa had ceased, the bowels moving regularly with slight discomfort.

Two years after the operation, patient reports that with the exception of occasional constipation, he is perfectly well. The microscopic examination of the growth shows it to be an adenocarcinoma.

Case 5.—P. H., aged sixty-five, referred by Dr. Niesley. Admitted to the hospital, February 3, 1904. Wife is said to have died of "cancer." Patient has always enjoyed excellent health. About four weeks ago, patient suffered from an attack of constipation with mild obstructive symptoms, which did not yield readily to catharsis. The last satisfactory movement occurred sixteen days prior to admission and since that time there have been only occasional small movements with the passage of gas after enemata. During this period there has been nausea with occasional vomiting and a variable degree of distention. There has been no loss of flesh and nothing abnormal in the character of the stool.

On examination, there is general endarteritis and moderate distention of the abdomen. No growth can be felt either through the abdominal wall or by rectum.

Operation.—Gas and ether. A median incision was made above the symphysis pubis and the peritoneal cavity opened. The sigmoid was examined and found in its upper part to be the site of a hard scirrhous growth with beginning glandular involvement. The intestine above the growth was moderately distended and congested. The growth involved the entire circumference of the gut. About four inches of the sigmoid and the contiguous mesentery were removed, followed by end-to-end anastomosis. Owing to the congested condition of the upper end, a small opening was made through its wall after the suture had been completed and a tube introduced toward the descending colon. It was thought that, by this means, the fecal current could be temporarily deflected until the congestion had subsided and the danger of leakage averted. The remainder of the abdominal incision was closed in the usual way.

Post-operative.—Patient developed considerable nausea and vomiting immediately after the operation, which, notwithstanding lavage, continued to his death. There was no abdominal pain, no rigidity or distention, and patient had several large soft fecal movements through the rectum within twelve hours after the operation had been concluded. There was no discharge of fecal material through the tube inserted into the descending colon until the second day. Patient died on the third day from heart failure due to the poor condition of his arteries.

Microscopic examination showed the growth to be an adenocarcinoma.

REMARKS ON CASES.

CASE I.—This case of strangulated hernia is of interest in that the gut, after the constriction was divided, was exposed for 24 hours beneath a temporary dressing before the question of gangrene could be determined. This same procedure was followed in a similar case reported in the Presbyterian Hospital report of 1902, in which the suspicious gut eventually proved viable. The delay in the completion of the operation in both cases did not seem to jeopardize the recovery of the patient.

The development of the fecal fistula was expected and was associated with no general constitutional disturbance. From the nature of the discharge an artificial anus would probably have resulted in the subsequent emaciation and star-

vation of the patient. As a matter of fact, the absence of any disturbance of nutrition in the present instance was due to the short duration of the fistula as well as to the fact that, even when at its height, a sufficient amount of intestinal contents passed down the normal channel to form movements of moderate size and frequency.

Examination of the affected segment showed a necrosis more advanced in the mucous membrane than in the serous coat. The lumen was partially filled with most offensive fluid material.

CASE II.—The clinical features in this case of strangulated hernia are surely most atypical and unexpected. Notwithstanding that the contents of the sac were returned into the abdominal cavity by the gentle pressure of an ice-cap and by the raising of the foot of the bed without taxis or manipulation of any form, the primary constriction had been sufficiently severe to determine the gradual necrosis of the affected loop. That this should have taken place without local pain and with the presence of normal expansile impulse, with but slight nausea and attacks of vomiting separated by considerable intervals, with the almost daily movement of the bowels and with the frequent passage of flatus, is certainly most exceptional. As, however, the bowel became necrotic, paralysis of its muscle fibre led to the development of the symptoms of sub-acute obstruction. At the operation a small abscess was found, moderately circumscribed, containing bacilli coli communis, the result of the perforation which had taken place at one point of the constriction in the affected loop. Here again, because of the friable and congested ends of the gut and the presence of an abscess, a fecal fistula developed, but its prompt closure took place as the process of repair by granulation became advanced.

CASE III.—This case of adeno-carcinoma in the small intestine is of interest because of its rarity and, secondly. because of the resemblance of its clinical features to those occurring in malignant disease of the stomach, the nausea and vomiting occurring regularly within a short time after eating. Examination of the stomach contents, however, showed nothing abnormal and physical examination detected the growth in the lower right side of the abdomen, except when it was temporarily absent in the pelvis.

The short existence of the symptoms prior to the admission of the patient into the hospital is a forceful illustration of the fact that these growths may reach an advanced stage of development before the first symptoms appear.

CASES IV AND V.—The clinical features of Cases IV and V are those of more or less typical carcinoma of the sigmoid. Here again the comparatively short duration of the symptoms must be noted.

In this situation, the subjection of the suture line to the mechanical irritation and pressure of solid fecal material warrants the insertion of the abdominal drain, although some protection is afforded by the passage of a tube into the lumen of the gut above the point of suture.

In the first case the result proved most satisfactory and the patient is still free from recurrence. In the second case, unfortunately the general condition of the circulatory system was chiefly responsible for the patient's death. The method had, however, proved its value in that at no time after the operation was there any evidence of leakage or peritonitis.

In conclusion, it seems desirable to call attention to the danger of subsequent leakage in end-to-end anastomosis when the resected ends of the intestine are unduly congested or friable. This seems to have been the cause of the patient's death in many of the cases reported in the current literature on this subject. That this unfortunate termination can sometimes be averted by the method here suggested seems reasonable. If, however, the abdomen is to be tightly closed without the safeguard of moderate drainage or of temporary anchorage of the affected loop to the parietal peritoneum, then side-to-side anastomosis with the closure of the resected ends by the purse-string suture seems to yield the most satisfactory results. If the condition of the resected ends is normal, however, end-to-end anastomosis without drainage (except in the sigmoid) can be adopted without fear of subsequent peritonitis.